Introduction
Field Surveys and CADD Operations

- Equipment, Applications And Case Studies

Field Surveys

- Mainly GPS Surveys
  - Real Time Kinematics (RTK)
  - Static Sessions
- Supplemental Total Stations Surveys
- 3-D Laser Scanning (LIDAR Technology)

GPS Surveys

- Continuous Signals from Satellites
- Signal Reception on Ground (Base and Rover)
- Differential Corrections through Radio Signals (x,y and z for each location)

The GPS Constellation

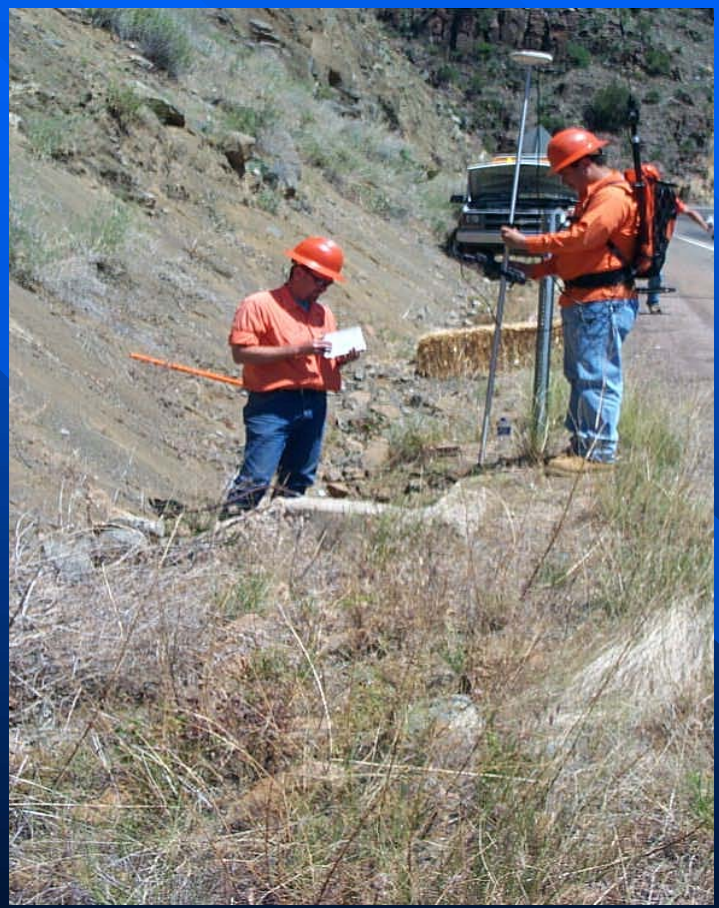
- 6 Orbital planes
- 4 SVs on each orbit
- 55° Inclination
- 20200 km Altitude
- 12 Hour orbits
- 5 Hour SV visibility

- 4 SV PDOP (5° Mask Angle)
- Maintain consistent ground tracks

GPS Equipment

Rover in Action

Base is Set on a Control Station



Practical Considerations

- Mission Planning (Best Time for Data Collection, Satellite Configuration)
- Verification of Existing Control
- Data Analysis:
  - Reference Frame (State Plane Coordinate System)
  - Datums
  - Ground Adjustment Factors

Search for Control Stations

State Plane Coordinate System

- Three Zones in Arizona:
  - West Zone
  - Central Zone
  - East Zone
- Datums:
  - NAD 83/92 (Horizontal)
  - NAVD 88 (Vertical)

Ground Adjustment Factor

- Very Important, Brings Measured Grid Values to the Ground Surface
- Related to:

  Elevation of Site

  Projection on a Plane Surface

Total Station Surveys

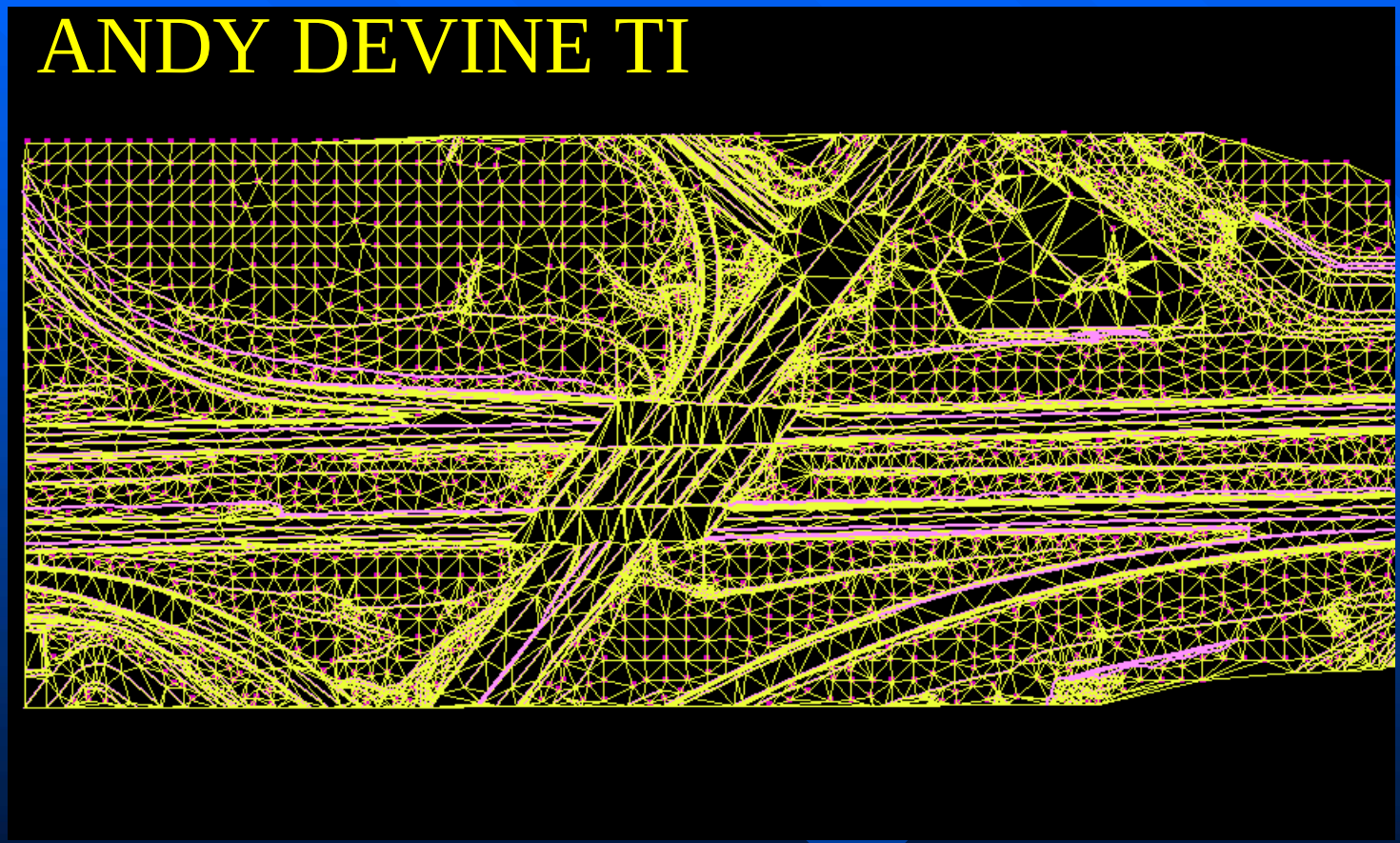
- Optical Devices
- Used for Measuring Horizontal and Vertical Angles, and Slope Distances
- Replaced Transits, Theodolites, and EDM
- Used in Areas with Hard-To-Get GPS Signals (Under a Canopy)
- More Accuracy

Total Station Equipment

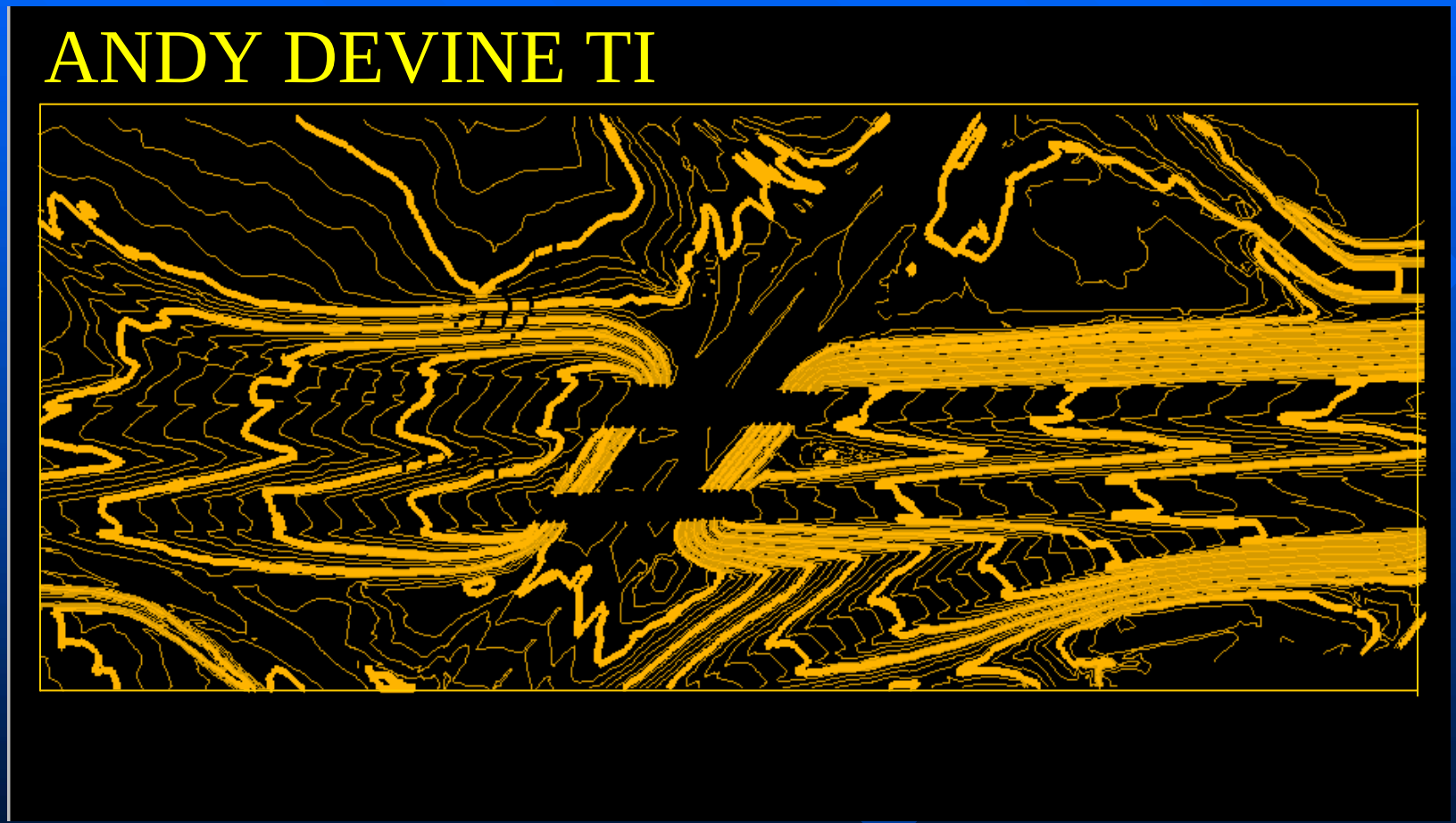
Field Surveys Applications

- Generation of Topographic Maps
  - Digital Terrain Models
  - Contour Maps
- Generation of Highway Alignments
  - Horizontal and Vertical
- Definitions of Planimetric Features
  - Structures and Buildings
  - Utilities and Drainage Structures

Generation of DTM



Generation of Contour Maps



Generation of Highway Alignments

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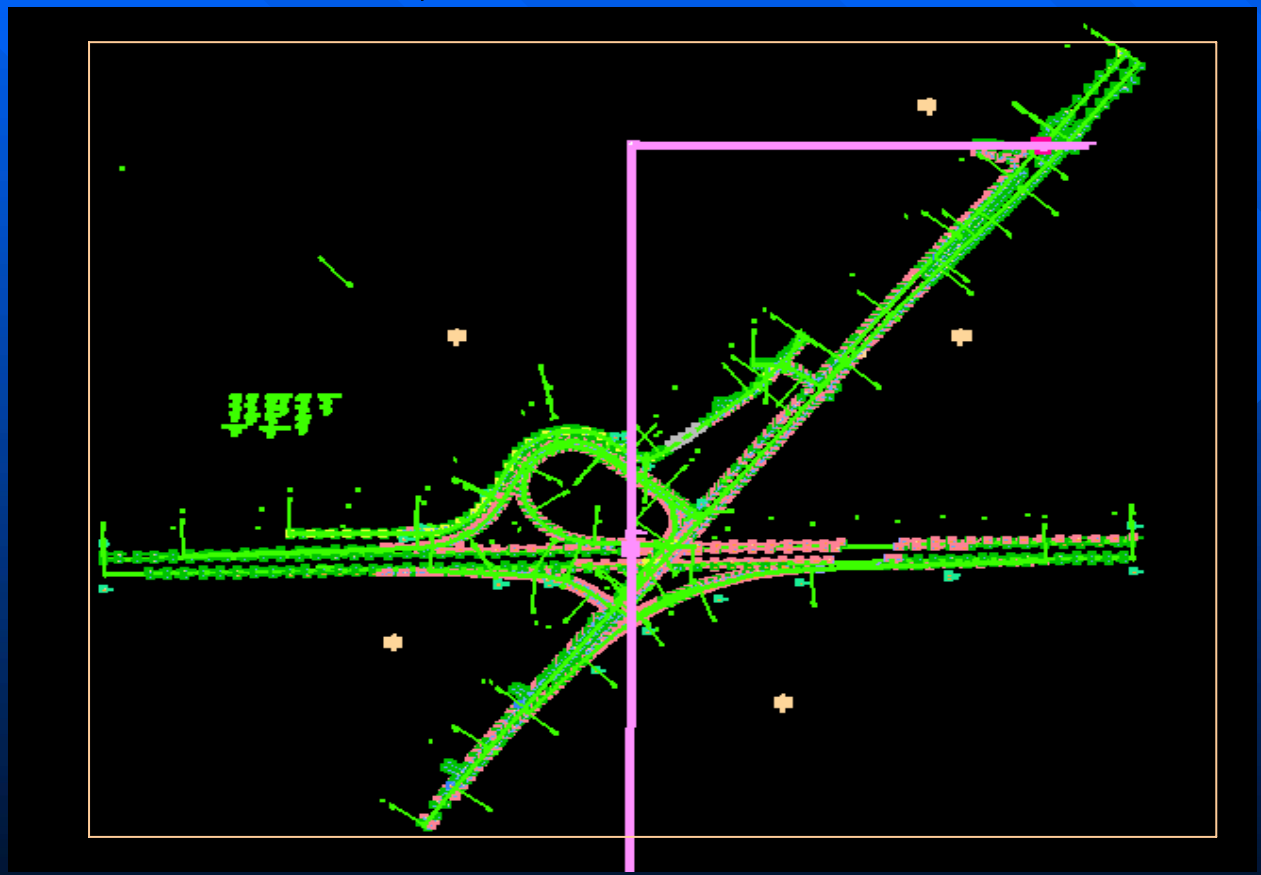

Definitions of Planimetric Features

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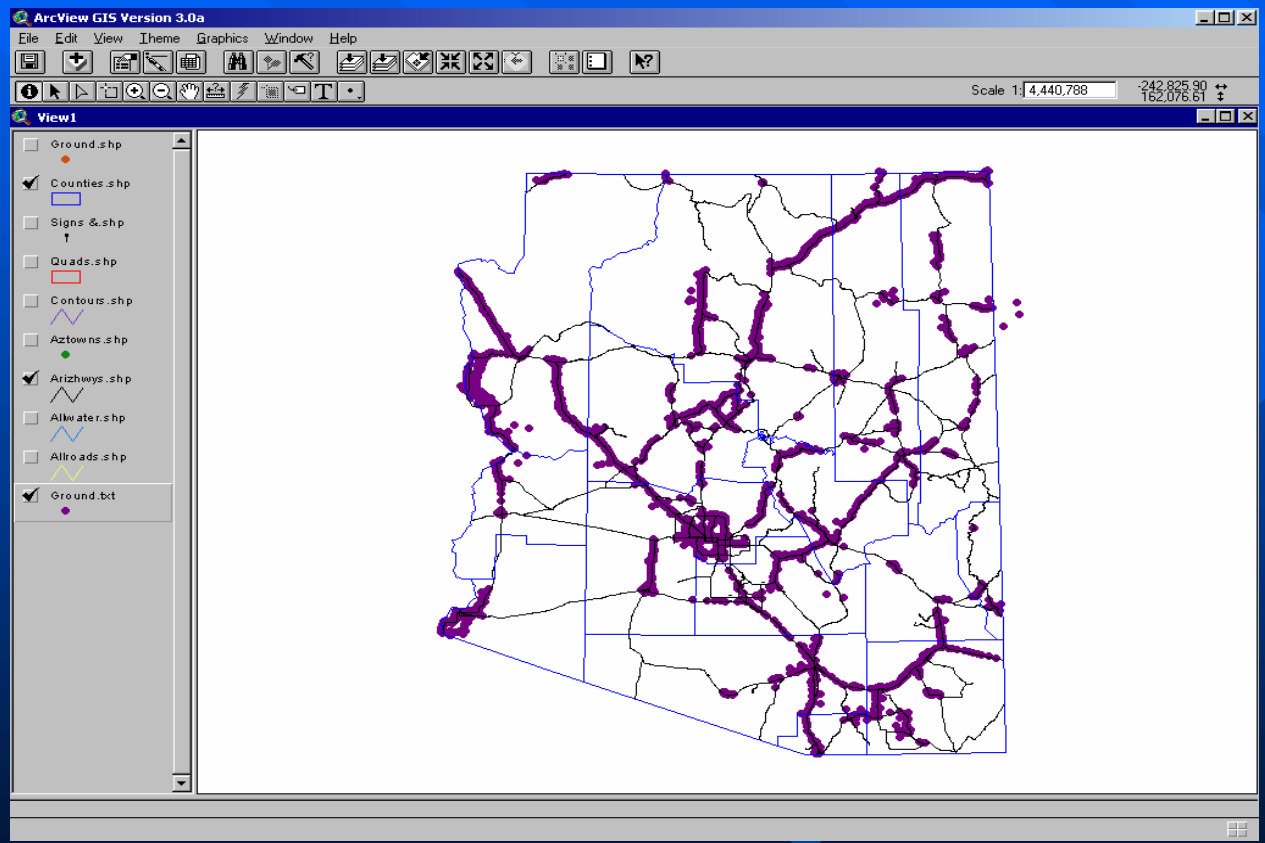
Common Uses of Survey and CADD Data

- Assist Highway Designers in Selection of Best Routes
- Balancing Cut and Fill
- Hydrological and Drainage Studies
- Bridge Clearances
- Forensic Investigations (Accidents)
- Inventory (Guardrail, Highway Signs, Manholes, etc.)

Integration of Survey Data Into A GIS System

- Development of Database: Route, MP, TRACS Number, etc.
- Arcview GIS Graphical Presentation
- Easy Identification of Existing Mapping
- Immediate Assistance to ADOT Project Managers and Consultants

Summary of ADOT Surveying and Mapping Projects, 2000-Present



Zoom In To A Specific Area
I-10 and US 191